presently claimed invention, including wherein the epoxy resin contains at least one kind of an epoxy resin having a biphenyl structure in the molecule, as compared with, for example, a composition containing a brominated bisphenol A epoxy resin formulation disclosed in the closest prior art (No. WO 01/70885 to Mizuno, et al., corresponding to U.S. Patent No. 7,157,506 to Mizuno, et al.; while the applied reference is No. WO 01/70885, reference in the following will be to the disclosure in its English equivalent, U.S. Patent No. 7,157,506).

That is, in the enclosed Second Declaration, the formulation of Example 19 of U.S. Patent No. 7,157,506, containing the brominated bisphenol A epoxy resin, was compared with formulations within the scope of the present invention, where the brominated bisphenol A epoxy resin is replaced with the epoxy resin having a biphenyl structure in the molecule as in the present claims.

In particular, attention is respectfully directed to the various Samples (EX-15 to EX-20) used in the enclosed Second Declaration. EX-15 is a replicated composition based on the description of Example 19 of U.S. Patent No. 7,157,506, while EX-16 uses an equivalent weight amount of biphenyl type epoxy resin in place of the brominated bisphenol A epoxy resin of Example 19 of No. 7,157,506. EX-17 uses an equivalent epoxy equivalence ratio of biphenyl type epoxy resin in place of brominated bisphenol A epoxy resin double that of biphenyl type epoxy resin; two comparisons have been made, using (i) an equivalent weight amount (EX-16) and (ii) an equivalent epoxy equivalence ratio (EX-17), for comparison with the brominated bisphenol A epoxy resin in Example 19 of U.S. Patent No. 7,157,506.

Note also EX-18 of the enclosed Second Declaration, which is a replicated composition with equivalent formulation of EX-16 of the above-identified application, while EX-19 uses a varnish composition with the bromated bisphenol A epoxy resin

removed from the formulation of Example 16 of the present application, making it a composition using as the epoxy resin solely the biphenyl type epoxy resin; and EX-20 is a varnish composition where the biphenyl type epoxy resin is removed from the formulation of EX-18, making it solely of the brominated bisphenol A epoxy resin system outside the scope of the present claims.

Thus, in summary, Examples EX-15 and EX-20 fall outside the scope of the present claims being considered on the merits in the above-identified application, while the remaining examples of the enclosed Second Declaration (EX-16, EX-17, EX-18, and Ex-19) fall within the scope of the present claims being considered on the merits in the above-identified application.

Preparations of the varnish compositions for each of EX-15 through EX-20 are set forth on pages 3-5 of the enclosed Second Declaration; and preparation of the prepregs using these various resin varnishes, and preparation of the copper clad laminated board using the prepared prepregs, respectively are set forth in the paragraph bridging pages 5 and 6, and in the first full paragraph on page 6, of the enclosed Second Declaration.

Attention is also directed to the results as shown in Table 2 of the enclosed Second Declaration, on page 8 thereof. As can be seen in Table 2, and as discussed in the first three paragraphs on page 9 of the enclosed Second Declaration, the present invention achieves dielectric characteristics including stable dielectric characteristics, as well as mechanical properties such as bending properties, and such as breaking strength and breaking elongation at room temperature, seen in EX-16 and EX-17, which are unexpectedly better as compared with results when using EX-15, outside the scope of the present claims.

Moreover, the laminated board using the varnish of EX-18, within the scope of the present claims, replicated practically all characteristics of Example 16 of the above-identified application; and effects of the present invention are maintained in EX-19, also within the scope of the present claims (where the brominated bisphenol A epoxy resin is removed from the formulation of EX-18, making it a composition wherein the epoxy resin is solely of the biphenyl type epoxy resin system), thus within the scope of the present claims. EX-19, showed slightly better results than that of EX-18 in dielectric properties, drifting property of dielectric characteristics and bending properties; while, on the other hand, EX-20, wherein the biphenyl type epoxy resin is removed from the formulation of EX-18, thus making it outside the scope of the present claims, with the epoxy resin being solely of the brominated bisphenol A epoxy resin, was confirmed to show much inferior results than the above properties.

In summary, comparing the results in EX-16 and EX-17 with the results in EX-15 outside the scope of the present claims, unexpectedly better results are achieved according to the present invention. Similarly comparing EX-18 and EX-19, within the scope of the present claims, with EX-20 outside the scope of the present claims, also unexpectedly better results are achieved by the present invention.

Attention is also directed to the Conclusion on page 10 of the enclosed Second Declaration, wherein the Declarant sets forth that the above results showed unexpectedly better results achieved by the presently claimed invention in direct comparison to epoxy resin compositions with the brominated bisphenol A epoxy resin formulation disclosed in U.S. Patent No. 7,157,506.

In connection with this Second Declaration, attention is respectfully directed to comments by the Examiner in Item 2 on page 2, and in Item 4 on page 3, of the

Office Action dated August 12, 2009. Thus, the Examiner notes that the Declaration Under 37 CFR 1.132 submitted June 16, 2009 (hereinafter "First Declaration"), and examples in the Specification, do not address "criticality of the claimed from 10 to 250 parts by weight per 100 parts by weight of the cyanate ester compound of biphenyl epoxy resin via a direct comparison with an equivalent amount of the closest prior art brominated bisphenol A epoxy resin ESB400T shown in Example 19 (col. 40) of Mizuno et al. wherein the types and amount of all other components are held constant", the Examiner further contending that the First Declaration "does not compare [the claimed proportion range of two types of biphenyl epoxy resin] to the brominated bisphenol A epoxy resin ESB400T of Mizuno et al.". It is respectfully submitted that the enclosed Second Declaration provides such comparison to the brominated bisphenol A epoxy resin ESB400T of Mizuno, et al., providing the comparison set forth by the Examiner; and it is respectfully submitted that the evidence in this Second Declaration shows unexpectedly better results for the presently claimed invention, in connection with this comparison referred to by the Examiner.

Applicants still rely on the aforementioned First Declaration. This First Declaration provides experimental data that by including the biphenyl structure-containing epoxy resin as in claim 10, with amount of epoxy resin as in claim 10, unexpectedly better results are achieved. Specifically, note the experimentation conducted, described on pages 2-5 of the First Declaration. Note also the experimental results as set forth in Tables 1-1 and 1-2 on pages 6 and 7 of the First Declaration.

See also the discussion of the results, set forth in the first three paragraphs on page 8 of the First Declaration. Specifically, unexpectedly better results were

achieved where the resin composition included 10-250 parts by weight of the epoxy resin (in particular, the biphenyl epoxy resin), based on 100 parts by weight of cyanate compound. The resin composition including the epoxy resin as in the present claims, particularly in amounts thereof as in the present claims, had improved humidity resistance, heat resistance at the time of humid conditions, bending strength, elongation, and dielectric characteristics at high frequency band regions. Note the first paragraph on page 8 of the First Declaration. Note also the second paragraph on page 8 of the First Declaration, pointing out that laminated boards with a formulation ratio of biphenyl epoxy resin and cyanate compound as in the present claims, gave good values in dielectric constant at 1 GHz and in dielectric dissipation factor, having values applicable to high end applications for high speed and high frequency regions. In comparison, Examples 8 and 14, prepared with higher amounts that the amounts in the present claims, gave poorer dielectric constant and dielectric dissipation factor values, applicable to applications for middle high speed and high frequency regions. Note also the third paragraph on page 8 of the First Declaration, showing that the laminated boards with amounts of epoxy resin within the scope of the present claims show good solder heat resistance under humid conditions and high bending strength and elongation, as compared with Examples 1 and 9 prepared with a smaller amount of the epoxy resin and giving poor results in solder heat resistance under humid conditions, bending strength and elongation compared with other laminated boards.

See also the Conclusion in this First Declaration, in the paragraph bridging pages 8 and 9 thereof.

It is respectfully submitted that this First Declaration, especially when taken together with the Second Declaration, provides evidence establishing unexpectedly

better results achieved by the present invention, establishing unobviousness of the presently claimed invention, even assuming, *arguendo*, that the teachings of the applied reference would have established a *prima facie* case of obviousness (as set forth in the following, it is respectfully submitted that the teachings of the applied reference would not have established such *prima facie* case).

That is, in view of the foregoing and in view of the following, it is respectfully submitted that all of the claims presently being considered on the merits in the above-identified application patentably distinguish over the teachings of the reference applied by the Examiner in the Office Action mailed August 12, 2009, that is, the teachings of No. WO 01/70885, under the provisions of 35 USC 103.

As indicated previously, and as done by the Examiner in the Office Action dated August 12, 2009, reference in the following to the applied prior art (that is, No. WO 01/70885) will be made by reference to the equivalent disclosure in U.S. Patent No. 7,157,506 to Mizuno, et al.

It is respectfully submitted that this reference as applied by the Examiner would have neither taught nor would have suggested such a resin composition as in the present claims, including, in addition to the recited cyanate ester compound, monovalent phenol compound and polyphenylene ether resin, an epoxy resin containing at least one kind of an epoxy resin having a biphenyl structure in the molecule, wherein the epoxy resin containing at least one kind of an epoxy resin having a biphenyl structure is contained in the composition in an amount of 10-250 parts by weight based on 100 parts by weight of the cyanate ester compound having 2 or more cyanate groups in the molecule and/or a prepolymer thereof. See claim 10.

In addition, it is respectfully submitted that the teachings of the applied reference would have neither disclosed nor would have suggested such resin composition as in the present claims, having features as discussed previously in connection with claim 10, and, additionally, wherein the epoxy resin containing at least one kind of an epoxy resin having a biphenyl structure is contained in an amount of 10-150 parts by weight (see claim 88), in particular, 10-100 parts by weight (see claim 89), of the cyanate ester having two or more cyanate groups in the molecule and/or a prepolymer thereof.

Moreover, it is respectfully submitted that this applied reference would have neither disclosed nor would have suggested such resin composition as in the present claims, having features as discussed previously in connection with claim 10, and, additionally, wherein an amount of the at least one kind of an epoxy resin having a biphenyl structure, of the total weight of the epoxy resin, is at least 50% by weight (see claim 90), more specifically at least 70% by weight (see claim 91), or is 100% by weight (see claim 92).

Furthermore, it is respectfully submitted that the teachings of the applied references would have neither disclosed nor would have suggested such resin composition as in the present claims, having features as discussed previously in connection with claim 10, and, moreover, wherein the composition includes amount of monovalent phenol compound as in claim 50; and/or wherein the cyanate ester compound or prepolymer thereof is at least one selected from the group set forth in claim 51; and/or wherein the epoxy resin having the biphenyl structure in the molecule is at least one selected from the group set forth in claim 52; and/or wherein the composition includes additional components, of a specified flame retardant (see

claim 53) or an antioxidant (see claim 54); and/or a resin varnish obtained by dissolving or dispersing the resin composition of claim 10 in a solvent (see claim 55).

In addition, and as discussed in the foregoing, even assuming, *arguendo*, that the teachings of the applied reference would have established a *prima facie* case of obviousness, the evidence presently of record, including Examples in the Specification and in particular, the experimental data in the above-mentioned First and Second Declarations, establishes unexpectedly better results achieved by the presently claimed invention, even assuming, *arguendo*, that Mizuno, et al. establishes a *prima facie* case of obviousness.

The invention as being considered on the merits herein is directed to a resin composition for printed wiring boards, and use of such resin composition, e.g., in a varnish, to be incorporated in a prepreg and a metal clad laminated board. In particular, the invention as being considered on the merits herein is directed to such composition and varnish, which can be used satisfactorily for electronic devices in which the operating frequency thereof exceeds 1 GHz.

In recent years, with advances in various devices including mobile communication devices, transmission of huge amounts of information with low loss and high speed is necessary, so that electrical signals having high frequencies have been used. However, at higher frequencies, electric signals likely decrease, so that it is required to use a material having low transmission loss for a printed wiring board to be used in these fields of art. That is, in a high frequency band region of 1 GHz or higher, a material having excellent dielectric characteristics represented by low values in dielectric constant and dielectric dissipation factor is needed.

Use of cyanate ester resins having good dielectric characteristics of a cured product, has attracted attention for printed wiring boards in recent years. Moreover,

it has been proposed to provide a resin composition in which a generally used epoxy resin such as a bisphenol A type epoxy resin, a phenol novolac type epoxy resin and a cresol novolac type epoxy resin is formulated with the cyanate ester resin for improvement of humidity or heat resistance. However, these resin compositions are inferior in dielectric characteristics, as compared to those in which no epoxy resin is formulated.

The present inventors have proposed a resin composition having sufficient dielectric characteristics, by modifying a cyanate ester resin with a specific monovalent phenol compound to prepare a phenol-modified cyanate ester resin composition; however, such resin composition has problems in connection with dielectric constant and dielectric dissipation factor, and stability of dielectric characteristics relative to temperature, as described in the paragraph bridging pages 2 and 3 of Applicants' specification.

Other resin compositions for printed wiring boards, utilizing a cyanate ester, are described on pages 3-5 of Applicants' specification; however, problems still exist in connection therewith, with respect to providing satisfactory electrical characteristics and stability thereof, especially under severe conditions.

Against this background, Applicants provide a resin composition for printed wiring boards, having good workability and excellent humidity and heat resistance, while also showing particularly excellent dielectric characteristics at high frequencies and excellent stability of dielectric characteristics. Applicants have found that by incorporating an epoxy resin having a biphenyl structure as at least one kind of epoxy resin in the resin composition, together with a cyanate ester compound having two or more cyanate groups in the molecule and/or a prepolymer thereof, as part of the resin composition of the present claims also including a monovalent phenol

compound and polyphenylene ether resin, wherein the epoxy resin is included in an amount as in the present claims, objectives of the present invention are achieved. In particular, a printed wiring board with good dielectric characteristics at high frequencies, and with stability of the dielectric characteristics even upon change in temperature, is achieved.

Attention is again directed to the First and Second Declarations, showing unexpectedly better results achieved by compositions according to the present invention, as discussed in detail previously.

In addition, attention is also directed to the experimental data in Applicants' specification. This experimental data must be considered in determining patentability of the presently claimed invention. See In re DeBlauwe, 222 USPQ 191 (CAFC 1984).

Note especially Tables 1, 3, 5 and 7, respectively on pages 48, 59, 70 and 81 of Applicants' specification, describing various Examples within the scope of the present claims, including amount of epoxy resin, and the comparative examples; and note the results in connection with each of these Examples and comparative examples, in Tables 2, 4, 6 and 8 respectively on pages 51, 61, 73 and 83, of Applicants' specification. In this regard, note that Table 2 shows results achieved in connection with the compositions in Table 1; Table 4 shows results achieved with respect to compositions in Table 3; Table 6 shows results achieved in connection with compositions in Table 5; and Table 8 shows results achieved in connection with compositions in Table 7.

It is respectfully submitted that the Examples and comparative examples show unexpectedly better results achieved according to the present invention, utilizing an epoxy resin wherein such epoxy resin includes an epoxy resin containing

a biphenyl structure in the molecule, with amount of epoxy resin as in the present claims. As to the comparison examples in the Tables, note the discussion of results in Table 2, on page 52, lines 1-20 of Applicants' specification. Note also the discussion of the results in Table 4, on page 62, lines 1-19, of Applicants' specification. See also the discussion of the results in Table 6, on page 74, lines 1-22, of Applicants' specification. And see a discussion concerning the results shown in Table 8, on page 84, lines 1-22, of Applicants' specification.

It is respectfully submitted that this evidence in Applicants' specification shown unexpectedly better results achieved by the presently claimed invention, containing, inter alia, the recited epoxy resin having a biphenyl structure in the molecule, especially containing amounts of the epoxy resin as in the present claims, supporting a conclusion of unobviousness of the presently claimed invention.

Mizuno, et al. discloses a resin composition suitable for printed wiring boards for various purposes, as described in column 1, lines 12-21 of No. 7,157,506. The resin composition is described generally in column 6, lines 6-30, and includes a phenol-modified cyanate ester oligomer containing a polyphenylene ether resin, prepared by a specific method. This patent discloses that an inorganic filler surface-treated with a silicone polymer having at least one specified siloxane unit is included in the composition. In column 15, lines 39-44, of Mizuno. et al., it is disclosed that the resin composition may be incorporated with a variety of resins or additives, for example, flame-retardant, epoxy resin or antioxidant, as required, within limits not harmful to characteristics of the resin composition. As for the epoxy resin, note illustrative epoxy resins set forth in the paragraph bridging columns 16 and 17 of this patent; see also column 17, line 35, describing that the quantity of the epoxy resin, when used, is not limited. Note also column 17, lines 35-42, describing preferred

amounts of epoxy resin relative to the cyanate compound. Note also Example 19 in column 40 of Mizuno, et al., describing a varnish including, inter alia, brominated bisphenol A type epoxy resin.

It is respectfully submitted that this reference discloses compositions optionally including epoxy resin. It is respectfully submitted that this reference does not disclose, nor would have suggested, including the specific epoxy resin as recited in the present claims, especially in amounts as in the present claims, and in particular the unexpectedly better results achieved thereby, as seen in the evidence of record.

It is emphasized that the present invention, including components as in the present claims, which include the specified epoxy resin containing at least one kind of an epoxy resin having a biphenyl structure in the molecule, contained in the amount of 10 to 250 parts by weight based on 100 parts by weight of the cyanate ester compound having two or more cyanate groups in the molecule or a prepolymer thereof, achieves better breaking strength and breaking elongation, with no cracking during a drilling treatment in providing a multi-layered printed wiring board. Further, compositions of the present invention provide printed wiring boards with dielectric characteristics that are stable upon changes in temperature.

Furthermore, the First Declaration shows that the present invention has the unexpectedly better results for the specific ranges of 10 to 250 parts by weight of biphenyl type epoxy resin based on 100 parts by weight of the cyanate ester compound; and the Second Declaration shows unexpectedly better results as compared with the closest prior art as characterized by the Examiner, the epoxy resin used in Example 19 of Mizuno, et al.

Especially taking the First and Second Declarations together, and especially in light of the evidence (experimental data) in Applicants' specification, it is respectfully submitted that the evidence of record shows unexpectedly better results over the closest prior art, for the entire range of amount of biphenyl epoxy resin as in the present claims, establishing unobviousness of the presently claimed subject matter.

In view of the foregoing comments and enclosed Second Declaration, as well as in light of the concurrently filed RCE Transmittal, entry of the enclosed Second Declaration and present Remarks, and reconsideration and allowance of all claims being considered on the merits in the above-identified application, respectfully requested.

To the extent necessary, Applicants hereby petition for an extension of time under 37 CFR 1.136. Kindly charge any shortage of fees due in connection with the filing of this paper, including any extension of time fees, to the Deposit Account of Antonelli, Terry, Stout & Kraus, LLP, Account No. 01-2135 (case 511.44961X00), and please credit any overpayments to such Deposit Account.

Respectfully submitted,

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Enclosure: Declaration Under 37 CFR 1.132 (Y. Mizuno, 10 pp.)

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